L4: Entry 8 of 9 File: USPT Oct 18, 1988

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TITLE: Polyester resin compositions

Brief Summary Text (3):
Polyethylene terephthalate (hereinafter referred to as PET) exhibits excellent heat resistance, chemical resistance, mechanical properties and electrical properties and had been used in many industrial products in the form of fibers, films and the like. Particularly, PET reinforced by inorganic fillers such as glass fibers possesses remarkably improved thermal and mechanical properties and is currently widely used in such applications as engineering plastics.

Brief Summary Text (4):
However, PET and filler-reinforced PET are not fully satisfactory in terms of the impact resistance of shaped articles and they sometimes present problems as the shaped articles chip or break in the course of manufacture, during transportation, or in use of the final products. With respect to impact resistance, PET is even inferior to poly1,4-butylene terephthalate) (hereinafter referred to as PBT) which is also a thermoplastic polyester.

Brief Summary Text (77):
The filler used in the third and fourth embodiments of the present invention is a material that may be fibrous, sheet-like or granular or of mixed shape. The fibrous fillers include inorganic fibers such as glass fiber, carbon fiber, graphite fiber, metal fiber, silicon carbide fiber, asbestos fiber, wollastonite, fibrous potassium titanate, and the like, whiskers, various organic fibers, and the like. Preferred are glass fibers but there is no limit to the type of filler that can be used and those suitable for particular reinforcing objectives such as improvement in mechanical properties, increase in heat resistance, imparting electrical conductivity, improvement in frictional characteristics, increase in flame retardation, and the like can be selectively employed.

Brief Summary Text (78):
The sheet-like or granular filling agents include, among others, mica (muscovite, phlogopite, sericite, and the like), clay, glass flake, glass beads, talc, metal foil and the like.

Brief Summary Text (81):
The proportion of such reinforcing filler or fillers is from 10 to 150 parts by weight preferably 10 to 120 parts by weight to 100 parts by weight of thermoplastic polyesters [the combined total of component (a) and component (b)]. If the proportion is less than 10 parts by weight, the sufficient mechanical strength and heat resistance desired in reinforced PET cannot be obtained and the improvement of the present invention on impact resistance is not realized. If the proportion of said filler or fillers is beyond 150 parts by weight, the fluidity or flowability of the composition in the molding process is not as high as desired and the surface gloss of the resulting shaped articles is apt to be adversely affected.

Brief Summary Text (85):
These polyesters, ionic copolymers [and optionally poly(.alpha.-olefin) type copolymers, block copolyetherester elastomers and/or fillers)] can be admixed, melted and molded into a desired shaped article in one operation but they may be preliminarily mixed and melted to prepare pellets or chips and, then, the desired shaped article can be manufactured utilizing such pellets or chips. Therefore, in the terminology of the present invention, the composition of polyesters and ionic copolymers [and optionally poly(.alpha.-olefin) type copolymers, block copolyetherester elastomers and/or

reinforcing fillers] means not only a mixture of the respective component powders or grains but also a pre-melted mixture of these components.

Detailed Description Text (60):
PET with an inherent viscosity of 0.68, which had been thoroughly dried in a dehumidifying dryer, was mixed with predetermined proportions of PBT with an inherent viscosity of 0.85, ethylene-methacrylic acid copolymer sodium salt (methacrylic acid (salt) content 7 mole %, degree of neutralization 80%) as the ionic copolymer, ethyleneacrylic acid-ethyl acrylate copolymer (acrylic acid content 0.5 mole %, ethyl acrylate content 6 mole %) as the poly(.alpha.-olefin) type copolymer, chopped strand (Nitto Boseki Co., Ltd.) as the glass fiber, and PHOSPHITE 168 (Ciba-Geigy) as the antioxidant as shown in Table 5. The composition was molded under the same conditions as Examples 31 to 38 to give testpieces having a thickness of 3 mm. The impact strength (Izod, notched) and tensile strength (JIS K 7113) values are shown in Table 5.

Detailed Description Text (61):
It will be apparent from Example 51 in Table 5 that the impact strength of the article is maximal when the proportion of PBT is about 40 parts by weight to 60 parts by weight of PET in the composition and the impact strength value was extremely high for filler-reinforced PET resins. When the proportion of PBT in 100 parts by weight of PET and PBT combined is less than 20 parts by weight, the above synergistic effect was no longer obtained (Comparative Examples 38 and 39). On the other hand, when the proportion of PBT was too large, the impact strength values were low, approaching the values found on mere modification of glass fiber-reinforced PBT resin with an ionic copolymer (Comparative Examples 43, 44 and 45).

Detailed Description Text (63):
When the proportion of glass fiber was less than 10 parts by weight relative to 100 parts by weight of the polyesters combined as in Comparative Example 41, the impact strength of the shaped article was low.

Detailed Description Text (80):
A testpiece was molded by the same procedure as Example 51 except that undried PET with a moisture content of 0.1% was used. The impact strength of this testpiece was 19 kg.cm/cm (Izod, notched) which represented a 75% retention of impact strength as compared with Example 51 wherein thoroughly dried PET was employed. When, for comparison, a composition consisting of PET with a moisture content of 0.1% and glass fiber only was injection-molded in the same manner as Example 51, the impact strength of the shaped article was only 55% that of the article made from thoroughly dried PET. It is thus apparent that even when moist PET is employed, the composition according to the present invention shows a comparatively better retention of impact strength.

Detailed Description Text (88):
The same polyethylene terephthalate, polybutylene terephthalate, ionic copolymer and block copolyetherester elastomer as those used in Examples 31 to 38 were preliminarily compounded with 3 mm-long bundled chopped strand (Nitto Boseki Co., Ltd.) as glass fiber and PHOSPHITE 168 (Ciba-Geigy) as antioxidant in the proportions indicated in Table 7 and the composition was molded under the same conditions as Examples 31 to 38 to give testpieces having a thickness of 3 mm. The impact strength (Izod, notched JIS K7110) and tensile strength (JIS K7113) of the testpieces are given in Table 7.

Detailed Description Text (89):
It is clear from the examples in Table 7 that the impact strength is maximal when the ratio of PBT to PET is about 40 to 60 on a weight basis and the value was extremely high for filler-reinforced PET resin. When the proportion of PBT was less than 20 parts by weight based on 100 parts by weight of PET and PBT combined, the above synergistic effect was no longer observed (Comparative Example 56). On the other hand, when the proportion of PBT was excessive, the impact strength decreased, approaching the value attained by mere modification of glass fiber-reinforced PBT as such with the ionic copolymer (Comparative Examples 60, 61 and 62).

Detailed Description Text (92):
When the proportion of glass fiber was less than 10 parts by weight relative to 100 parts by weight of the whole polyester component, the impact strength was low as evidenced by Comparative Example 59.

Detailed Description Text (106):
A testpiece was molded in the same manner as Example 72 except that undried PET with a moisture content of 0.1% was used. The impact strength of the resulting shaped article

was 16 kg.cm/cm (Izod, notched) which represented a retention rate of 73% as compared with Example 72 wherein bone-dry PET was employed. When, for comparison, a composition consisting of PET with 0.1% moisture and glass fiber only was injection-molded in the same manner as Example 72, the impact strength of the shaped article was 55% as compared with a similar composition containing bone-dry PET. It is, therefore, apparent that even when moist PET is employed, the composition according to the present invention shows a comparatively good retention of physical properties.

CLAIMS:

11. A polyester resin composition according to claim 7 wherein component (e) is glass fiber.